Review

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Comprehensive study on headache in otorhinolaryngology

Oğuzhan Oğuz[1], Zeynel Öztürk[2], Mustafa Yazır[3]

[1]*Department of Otolaryngology, Dr. Oğuzhan Oğuz Wellnose Clinic, İstanbul, Turkiye*
[2]*Department of Otolaryngology, Otolaryngology Clinic, Baypark Hospital, İstanbul, Turkiye*
[3]*Department of Otolaryngology, Yazır Private Otorhinolaryngology Clinic, İzmir, Turkiye*

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ABSTRACT

Otorhinolaryngologists are the first to receive numerous patients with headaches related to ear, nose, and throat (ENT) diseases. An otorhinolaryngologist frequently manages headaches unrelieved by a consultation practitioner with a general. Hence, it is natural that the etiology and treatments of headaches and ENT diseases have become the otorhinolaryngologist's concern. Approximately 47% of all US adults have experienced headaches or migraines in the past year. The most common type of headache is a tension-type headache. The second most common headache is reported as a primary headache, including migraine, tension-type headache, and cluster headache. According to the International classification of headache disorders, primary headaches, which are intrinsic and not caused by any other medical condition, and secondary headaches, which are symptomatic and arise from different illnesses or conditions, are related to otorhinolaryngology. Generally, primary headaches are more common than secondary ones. Migraines, tension-type headaches, and cluster headaches are common in this classification. Future research should primarily focus on the direction of the individually adapted treatment of the different headache entities with a special interest in comparing three arms per sub-entity: the placebo group as usual, the standard of treatment drug group, and a third arm with a substance of interest.

Keywords: Headache, otorhinolaryngology, sinusitis, rhinitis

INTRODUCTION

Headaches frequently accompany ear, nose, and throat (ENT) disorders. Otorhinolaryngologists are the first to receive numerous patients with headaches related to ENT diseases. An otorhinolaryngologist frequently manages headaches unrelieved by a consultation practitioner with a general. Hence, it is natural that the etiology and treatments of headaches and ENT diseases have become the otorhinolaryngologist's concern. Approximately 47% of all US adults have experienced headaches or migraines in the past year. The most common type of headache is a tension-type headache. The second most common headache is reported as a primary headache, including migraine, tension-type headache, and cluster headache. The type of headache may change with the progression of connected anatomical and physiological organs. Headaches may be connected directly to the organs of the head and neck or also to some factors of the cervical spine, such as the cervical prevertebral muscles, cervical dorsal, and spinal muscles, as well as a close relationship with the trigeminal afferents and posterior craniocervical afferents through the trigeminal-cervical and cervical-thalamic pathways. The close relationship with the trigeminal and spinal afferents is evidence of a continuous connection from the trigeminal region to the cervical spine, based on the theory that the main central mechanisms of migraine and tension-type headaches share the same pathways and that each has a different central sensitization in the trigeminal and cervical pathways. Because of the continuous relationship of the connected organs and the possible sharing aspect, if the pericranial pain inputs trigger those processes, it is crucial that the physician not only diagnose the etiology of the headache and treat it but also consider the other possible connected headaches or diseases.[1,2]

ANATOMY AND PHYSIOLOGY OF HEADACHE IN OTORHINOLARYNGOLOGY

The anatomical and physiological aspects of headache in connection with otorhinolaryngology include the relationships between head and neck structures, mastoiditis, petrositis, and diseases of the ear, nose, and paranasal sinuses. Knowledge of this topic is essential for diagnostic purposes. Headache is the most frequent cause of humans visiting neurologists and ENT clinics. It is a complicated and extensive issue, and it is hard to accurately diagnose the headache since it originated from several complex and intricate physiological networks. The relationship between local head and neck disorders and headaches has long been described. The pain of any part of the head is said to originate from the differentiation of the

Corresponding Author: Oğuzhan Oğuz, oguzhanoguz2023@outlook.com

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innervation of the cranial dura mater referred to as the cervical periorbit.[3,4]

The intimate relationships between the pain neurons of the cranial dura, the delicate cervical joints, the muscular tissues that insert into the delicate junctions of the cervical spine, and, laterally, the sensory trigeminal nerves are said to be the source of headache regardless of the pathology of any structure. Meningeal afferents contain nerve trunks near the communicating innervations and the trigeminocervical system. The cranium and dura mater arteries are original with nociceptors and syringe afferents; hence, hypertension might cause headaches directly. In plasma and cerebrospinal fluid, certain substances are raised during the assaults. The MRI of the cranial migraineurs shows the linear significance of VOR along the prolonged trigeminal nerves and in their perivascular spaces; this finding is usually combined with the MRI findings of the sinus innervation of the dura. Such a finding is regarded as synaptic hyperactivity in the corticomedullary region.[1-4]

CLASSIFICATION OF HEADACHES RELEVANT TO OTORHINOLARYNGOLOGY

According to the International classification of headache disorders, primary headaches, which are intrinsic and not caused by any other medical condition, and secondary headaches, or those that are symptomatic and arise from different illnesses or conditions, are related to otorhinolaryngology. Generally, primary headaches are more common than secondary ones. Migraines, tension-type headaches, and cluster headaches are common in this classification. Moreover, headaches that may coincide with otorhinolaryngology diseases, such as vestibular migraines and those that trigger Meniere syndrome, vestibular schwannoma, and aural fullness, are also included in this classification. In contrast, secondary headaches are rare in the field of otorhinolaryngology. Examples include headaches stemming from cervical pathology, cervicogenic headaches, and intracranial vascular headaches resulting from acute head and neck diseases in the otorhinolaryngology field. The distinction between primary and secondary headaches is crucial for patients presenting with otorhinolaryngological signs and symptoms. Migraines, tension-type headaches, and cluster headaches are the primary clinical entities in the headaches category. A thorough examination of patients with primary headaches is valuable for making a definitive diagnosis by an otorhinolaryngologist. The headaches that may coincide with otorhinolaryngology diseases interest both neurologists and otorhinolaryngologists. However, secondary headaches, such as intracranial vascular headaches caused by acute head and neck diseases, should not be overlooked in the treatment of patients exhibiting cluster-like headaches.[2-4]

Primary Headaches

Primary headaches do not arise from a head injury, sinus or otologic inflammation, cervical abnormalities, or other facial or cranial structures. The International headache society proposed a more specific classification. They are subdivided into four headache types: migraine, tension-type headache, trigeminal autonomic cephalalgias, and other primary headache disorders. The three most common primary headaches in clinics are migraines, tension-type headaches, and cluster headaches.[5]

Epidemiological data in non-selected populations suggest that migraines are more prevalent in women than in men. Conversely, both men and women are equally affected by tension-type headaches, with a prevalence of 45% across their lifespan. In comparison, cluster headaches are more common in men than in women and have an incidence ranging from 45 to 69 per 100.000 people. Concerning their clinical presentation, tension-type headaches and migraines follow an episodic or chronic pattern. Episodic tension-type headaches occur for less than 15 days per month, while chronic tension-type headaches last for 15 days or more per month. Migraines can similarly be classified as episodic or chronic disorders based on headache frequency. Lastly, the underlying pathophysiology of these headaches may be neurogenetic in origin and is usually triggered by one or a combination of triggers, including stress, psychiatric diseases, physical exertion, head or neck pain, and upper respiratory tract infection.[5-7]

Genetics can predispose individuals to develop these headaches, but not all people with these genes will experience headaches. The first gene related to migraines was identified in 1996. When mutated, this gene was found to be associated with typical migraines and other related issues, such as hemiplegic migraines, inherited episodic ataxias, and other progressive neurodegenerative diseases. These genetic mutations could explain the clinical heterogeneity of disorders seen within families and the variability in attack frequency, severity, and duration. While a genetic basis is suspected, the triggers for migraines and tension-type headaches remain somewhat controversial. Headache triggers are mainly related to lifestyle or environmental factors. For example, lifestyle factors such as excessive caffeine intake, insufficient sleep, and bad posture can exacerbate headache frequency or intensity. Food triggers can vary, but alcoholic beverages and nitrate-rich foods are believed to be common migraine triggers. Lifestyle factors that may aggravate headaches include stress, physical activity, and the Valsalva maneuver. Daily headache diaries are proven to help identify headache triggers. Consequently, triggers vary among individuals according to their respective lifestyles and environments. Therefore, both medical and behavioral approaches are needed for consultation and explanation. Importantly, not all patients are aware of the triggers that exacerbate headache frequency or intensity, so patients are often advised to visit their headache specialist regularly.[3,4]

Secondary Headaches

Secondary headaches occur due to underlying disorders or other medical conditions known as "organic" headaches. Their identification is of utmost importance for accurate assessment to prevent possible severe pathologies, and without their ruling, a primary headache diagnosis cannot be confirmed. Sinusitis, other inflammatory pathologies, and neck disorders can present headaches as a leading symptom. Headache can also arise from central mediators involving the medulla and the upper spinal cord. Head trauma can either directly provoke intracranial pathology or lead to a diffuse axonal

injury. Clinical evaluation is mandatory for the diagnostic work-up. Still, in most of these cases, particularly intracranial pathologies, imaging is a key factor in confirming the diagnosis, preventing further mishaps, and planning the necessary intervention. The diagnostic assessment is, therefore, divided based on its etiology and pathophysiology. If headaches are severe or comport other neurological signs, a computed tomography (CT) scan or magnetic resonance imaging (MRI) should also be performed in the emergency setting or later. Depending on the organic condition, inflammation, infectious processes, space-occupying lesions, lesions affecting the fifth cranial nerve, and pulmonary infections can give rise to secondary headaches. The underlying organic disorder could be present in sinus pathology, intracranial pathology, cervical pain from nerve root compression, fibromuscular pain, and temporal arteritis. The pulsating character of the pain can indicate a vascular abnormality, leading to a secondary headache. Patients should be questioned about the localization of the pain, as posterior headache may be much more specific. Management and therapy are based on a treatment that must manage headache and the related primary condition responsible for the secondary headache. The guidelines are lacking in the literature, and no evidence-based recommended treatments are present. Medical societies must work to provide well-designed studies and agreed-upon pain management guidelines. Finally, it must be known that managing headaches is imperative to managing the secondary disorder. If a secondary condition involving the nervous system or brain is present, only when the secondary headache is treated can the clinical symptoms pointing to the diagnosis be obscured.[7,8]

EPIDEMIOLOGY OF HEADACHES IN OTORHINOLARYNGOLOGY

Headaches are one of the significant complaints presented to an otorhinolaryngologist and an allergist, neurologist, or an ENT specialist in their daily clinical practice. Aim: The objective of this review article was to have an in-depth discussion on the various aspects of headaches in ENT practice. It has been specialized into five sections, enunciating a broad coverage of the current scenario of headaches in the field of otorhinolaryngology. As ENT gets overlooked, numerous undiagnosed and untreated headaches flowing from the nose, sinuses, or pharynx result in chronic headaches that could have been cured had an early intervention been made.[8,9]

This article discusses the global perspective, advanced diagnosis, and management of primary headaches attributed to temporomandibular disorders. The international scenario illustrates that headaches can affect high scores worldwide, with some experiencing infrequent attacks while others have frequent headache attacks that require prophylaxis. Aim: This article is a narrative collation of their global prevalence as headaches are exclusively managed in the upper airway. Many risk factors are associated with headaches, exacerbating many comorbid conditions affecting health and negatively impacting a person's quality of life. One of the otorhinolaryngological frequent outpatient department visits is headache, and these patients are a set of demanding clients with multiple health problems. If all comorbid conditions are managed exquisitely, the headache will remain, yet the routine still is not considered in an otorhinolaryngologist's practice. In this narrative review, the focus is on headaches rather than the rhinogenic type. All the above minutiae have made us consolidate an exclusive focus on this topic for future guidelines. The statistical version of this data and spot verification would make things clear.[9,10]

It is indispensable to underline the epidemiological aspects of headaches in the crucial ENT structures of rhinological and otologic domains. Prevalence: The prevalence of headaches is a common health concern in otorhinolaryngological practice, affecting more than one-third of the general population of a geographic area. Overall, based on the data analysis from more than thirty studies, the prevalence is estimated at a 38% rate. Globally, the prevalence and frequency of headaches in high-income groups are much higher than those in low-income groups. It is further mentioned that biographical background, ethnicity, and socioeconomic and demographic groups in earlier studies have an essential influence on the increased prevalence of headache distribution. Gender: The prevalence rate is approximately 5-20% higher in females. Age: The occurrence of headaches in middle age is higher than in young and old populations. This trend has also been documented in various countries. Apart from these, there are no more findings on the general epidemiology of headaches in ENT. The aforementioned statistical inputs will help one to understand the burden of nuisance in a detailed patient encounter, intervention, and management of improved therapeutic outcomes. The geographic distribution shall help intensify the strategies to mitigate the burden of this nuisance in different continents. The younger populations will help expand the academic ecosystems in these countries regarding head and neck diseases, including headaches. In summary, it will help one understand the importance of managing headaches in the ENT fraternity field, which will also refine individual dedicated practice patterns.[9,10]

CLINICAL PRESENTATION AND DIAGNOSTIC EVALUATION OF HEADACHES IN OTORHINOLARYNGOLOGY

This section aims to guide a comprehensive study on headaches, including the up-to-date scientific literature and subjective knowledge through the experience of well-known experts. Headaches are frequently encountered complaints in otorhinolaryngology, as any structural abnormality, infection, or disease involving the ear, upper respiratory system, pharynx, or neck may result in headache. Clinicians should thoroughly question headache features, including onset, periodicity, time of the day or night, duration, localization, rapidity and degree of progression, character, quality, associated symptoms, medical and surgical history, and medications. At which crossroads they are diagnosed, and if a diagnosis of 'primary headache' has already been confirmed, they will be referred for reassurance, symptomatic therapy, or prophylactic treatment. Physical examination is critical in patients with a history and suspicion of a headache related to otorhinolaryngological structures or functions. Clinical and especially otorhinolaryngological examinations may reveal signs of primary and secondary headaches,

facilitating the differential diagnosis. Questionnaires and visual analog scales to evaluate headache pain, degree of disability, and quality of life are widely used in diagnosing primary and secondary headaches and monitoring the effects of headache treatments. A physical examination is crucial because almost all localizations of the primary and secondary headaches fall within or close to the structures examined by an otorhinolaryngologist. Neuroimaging is usually carried out with a CT scan and/or MRI in patients with headaches with signs and symptoms associated with neurological findings or a progressive, severe, or peculiar headache rather than in all patients with headaches. Patients should be categorized into organic, unspecified etiology, or non-organic/reassurance recommended by considering their clinical and corresponding imaging findings. Thus, it is essential to use clinical data, imaging findings, and experience in determining a differential diagnosis by considering the patient's primary or secondary headache disorder according to the localization and anatomic structures achieved. Patients with headaches are subject to a multidisciplinary approach in the form of functional neurology or pain service with an integrated headache clinic, both in primary and tertiary care. A comprehensive preoperative history and physical examination for optimizing patient selection and preventing unexpected headaches is necessary in patients undergoing otorhinolaryngologic surgery. Central and peripheral mechanisms are considered adequate in the genesis of headaches. Regardless of the headache's location and degree of severity, its diagnostic strategy is made by considering all clinical diagnostic findings.[11]

History Taking and Physical Examination

A standard brain exam can identify the majority of secondary etiologies in patients with a nonspecific headache. History-taking remains a valuable tool for diagnosing headaches. A well-conducted history identifies the characteristics of the headaches and applies to the various entities of headaches. In practice, a structured consultation can be organized around a set of questions focused on three goals: to rule out secondary headaches, to define the headache to provide etiological orientation and to understand the impact of this headache on the patient's quality of life.[10]

Checklist: headache, previous treatments, type of family history. The second stage of the consultation consists of searching for elements in the history that focus on the potentially determining or triggering elements. Triggers from the ENT field should be explored, and interesting questions include infection risk factors, chronic otitis, and ENT procedures. It is then essential to focus on neurological symptoms associated with headaches. In the presence of one or more elements suggesting secondary etiology, additional evaluations are often necessary, but not always; for example, the absence of a modified neurological examination may not be present in all forms of tumors, and the presence of a significant disorder does not exclude migraines or exacerbations.[9,10]

The physical examination has several objectives: to carry out a neurological examination, to identify changes in ENT and craniofacial structures, and to identify extracranial mechanisms likely to produce headaches. A complete examination of craniofacial structures must, therefore, be carried out. An initial interview must guide clinical maneuvers to determine if symptoms, typically epistaxis, hearing loss, vision loss, or facial discomfort, interfere with basic functions identified in the history. It is essential to exercise caution with specific patients or during a physical examination of the craniofacial region to ensure normal conduct and see if, under tension, signs of possible discomfort appear, as well as to ignore changes that are considered secondary. As with history taking, the physical examination may be routine but must not contain signals that suggest an abnormality. This double approach makes it possible, in part, to account for the diagnostic accuracy of headaches. They are complementary; the absence of abnormal elements in the history or the physical examination is likewise expected to be observed in those with the primary headache as in patients suffering from a chronic secondary etiology. History and physical examination must be carried out, depending on how methodically they are used to solicit all pertinent elements. Every question not asked represents an element of information, although not what could be used to confirm or rule out an abnormal process. Furthermore, the answers must be summarized at regular intervals to draw up lines of management. In conclusion, comprehensive history and physical examination are critical in guided management decisions.[11,12]

Imaging Studies

The role of imaging is to investigate the etiology, identify pathology, and explore possible causes of headaches resistant to medical management. Such imaging may be necessary for patients with warning signs and early morning headaches, where elevated intracranial pressure resulting from hydrocephalus needs to be ruled out. In all cases of new-onset headache accompanied by focal or generalized seizures, any neurological deficits or chronic progressive headaches should be considered. Patients with a history of recent significant trauma and those with potential post-trauma effects should also be evaluated. Imaging studies have diagnostic applications for identifying the etiology of headaches, including temporal bone inflammatory conditions and intracranial issues masses. There is no gold standard investigation for imaging of headache diagnosis; however, the most commonly used modality is MRI with and without intravenous gadolinium administration. MRI is the imaging modality used most frequently for anatomical investigation and physiological evaluation of the brain. CT investigates soft tissue and bone in the initial diagnosis or when MRI is contraindicated. Different studies have shown the superiority of these modalities in diagnosing various anatomical and physiological etiologies of headaches without any statistical evidence of the superiority of these imaging modalities. Head and neck digital subtraction angiography is reserved for vascular causes of headache in patients in whom other imaging modalities have failed to yield a diagnosis. Multi-detector-row CT angiography and MR imaging of the arterial and venous systems of the head and neck in various countries are currently performed with preference to MR due to its lower-risk applications. The radiation effects should be considered when CTA is performed in adult patients, as radiation exposure may have a more significant impact on brain tissue in younger patients because

of prolonged exposure periods and increased susceptibility to genetic mutations.[12,13] Unique protocols should be considered when ordering imaging, including:

- Indications for imaging.
- Appropriate timing and sequences for the relevant modality.
- Safety measures to prevent radiation exposure and adverse reactions in sensitive patients.

The balance between the yield of the diseases diagnosed and the safety measures to be undertaken has resulted in the following indications and safety checklist. Imaging must balance searching for yield and reducing the chance of complications, including a checklist comprising contraindications to be taken when ordering an imaging study in a headache patient. It should be noted that imaging findings such as temporal bone fistula, contaminated sinus, and sphenoid disease must correlate clinically. Rates of sinusitis detection at radiographic evaluation after clinical clearance vary from 14% to 53% of patients. This indicates that paranasal sinus abnormalities from radiographic studies contrast with the absence of clinical evidence of sinusitis, as demonstrated in children with headaches.

TREATMENT STRATEGIES FOR HEADACHES IN OTORHINOLARYNGOLOGY

Although the available treatment options for headaches within otorhinolaryngology have broadened due to the recent identification of several new noncerebral targets and the development of new treatments that utilize antibodies or neuromodulation techniques, invasive neuromodulation disputes the broad implementation of these endpoints. Monoclonal antibodies have shown modest effects in both trials and daily clinical practice, while there is still a lot of missing data. In addition, neuromodulation of pre-fixed stimulation sites has successfully treated several headache-inducing syndromes. Still, there is a lack of investigation into the modulation of electrically active stimulation sites. Future research into headache interventions should concentrate on patient-specific engineering, ranging from genetic profiles used to match drugs to the individual's migrainous burden to in vivo models that study novel molecules that might impart protection against headaches induced by compressive nerve injuries. It is conceivable that exploring the efficacy of interventions targeting nerves outside the cranium, either preventative or abortive, may also be relevant to the otorhinolaryngologist's practice. The mentioned drugs are tested in ongoing clinical trials.[14,15]

No genetic profiling studies regarding headache treatment in otorhinolaryngology have been published, but research in headaches is continuing. Pain's DNA profiling is also relevant for the ENT field. They are anticipated to come to the fore within the following years. The consensus concluded that a multidisciplinary approach offers an added advantage. More knowledge and education concerning headaches are required to help healthcare professionals disseminate newly found abilities and understandings. Using cumulative insights to drive future plans and identify unmet needs. Healthcare professionals used terms such as 'facets in understanding the headache' and 'moving with the times' to describe a forward-looking viewpoint. Recognition of additional techniques offers a new therapeutic perspective angle. There is a call for intensive research in TRH to develop and assess the feasibility and accuracy of the investigation. The evaluation of the practice of laboratory diagnostics presented in this paper also highlights the need for such research. Ongoing studies and consortium research in headaches will shed more light on this topic shortly. Ongoing research projects were discussed, including pharmacogenomics in primary headache disorders and using a new investigation technique in a patient with chronic headache.[14,15]

CONCLUSION

A comprehensive overview of the different entities of headaches in otorhinolaryngology and the modern knowledge on these topics was presented. Special emphasis was placed on the importance of correct diagnosis in order to agree on an interdisciplinary management strategy between specialists. Although different lines of the new treatment era have been addressed recently, such as monoclonal antibodies, neuromodulators, and special nerve stimulation techniques, focus was placed on evolving treatment modalities to close gaps in diagnostics and tailor individually adapted treatments. Particular attention was given to current research within otorhinolaryngology, such as exhale ventilatory inhibition in AVR and neurophysiological imaging in superior canal dehiscence.[4,6,14]

There is overwhelming modern evidence of the high interconnectivity of the pain processing network, not only between different sectors of the CNS but also in the potential interaction along the primary-afferent signaling transmitted along the periphery. This knowledge stresses the need to expand the education to specialists from other medical fields involved in caring for patients with headaches in otorhinolaryngology. Integrating this knowledge into an interdisciplinary treatment concept might reflect the individual constellation of possible interacting headache comorbidities and optimize treatment. The willingness to collaborate in multidisciplinary headache management could interlink neurologists with several substances of interest in headache patients from the field of otorhinolaryngology. However, this assumption requires validation in future trials. Future research should primarily focus on the direction of the individually adapted treatment of the different headache entities with a special interest in comparing three arms per sub-entity: the placebo group as usual, the standard of treatment drug group, and a third arm with a substance of interest.

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The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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